
Part 2. Verification Technologies

NATO's September 1989 verification package referred to the use of three surveillance methods: on-site inspection, national and multinational technical means and aerial surveillance. While it described the terms governing on-site inspections at some length, the latter two were discussed in considerably less detail. Nevertheless, both have a vital role to play in monitoring a reductions agreement. What capabilities are available for spaced-based and aerial surveillance?

National Technical Means¹

The American military reconnaissance satellite KH-11 (Keyhole 11), operational since December 1976, has the ability to monitor the Soviet Union and Eastern Europe in "real time" using a technology known as charge-coupled devices (CCDs). Developed in 1970 at the AT&T Bell Laboratories, the CCD is an array of thousands of very small light-sensitive sensors or picture elements ("pixels"). These pixels store electrons in proportion to the intensity of the light received. The number of electrons is then tallied and transmitted in digital form, along with the position of the pixel in the grid, via a communications satellite to the CIA satellite imagery centre located at Fort Belvoir, Virginia. Computers at the ground station receiving this digital information recreate the original image within minutes of the KH-11's overflight. On the satellite, the pixels are drained of their electrons and are once again ready for use, the entire procedure being completed within milliseconds. This technology frees satellite reconnaissance from the restrictions of photographic film and increases their operational life to two to three years depending upon fuel supplies.

The KH-11 is currently being replaced by the latest in the Keyhole series, the KH-12. This satellite, with a ground resolution of approximately 10 cm, is so large that only the space shuttle or Titan 34D7 booster rocket can carry it into orbit. The KH-12 is the first satellite with sufficient sensitivity for thermal infrared imaging, allowing it to "see" in the dark.

Future developments in the American military satellite reconnaissance program will focus on a technology known as the synthetic aperture radar (SAR). The resolution of satellite-borne conventional radars is restricted by the diameter of the receiving antenna; to increase resolution, the antenna must be physically enlarged beyond all reasonable practical limits. The SAR, however, expands the effective size of the antenna to one many kilometres in length through the selective combination of radar signal echoes by its computer. This technique increases the length of the synthetic antenna (without increasing the physical size of the antenna) equal to the distance travelled by the satellite during the time the signals

